AMENDMENTS TO THE DRAWINGS:

Applicants submit concurrently herewith four (4) sheets of annotated drawings illustrating Figs. 1-4 showing changes in red, accompanied by four (4) sheets of replacement drawings incorporating the amendments thereto.

Attachments: Replacement Sheets (4)
Annotated Sheet Showing Changes (4)

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

Although the Examiner is obviously already aware of related, copending, commonly assigned Serial No. 10/560,617 (published as US 2006/0126524 A1), attention is nevertheless directed to the attached Form PTO/SB/08a listing this document and also prior art therein currently of record for official consideration and citation in the present record. The IDS fee for this stage of prosecution is also attached. Return of a properly annotated Form PTO/SB/08a signifying consideration of such additional information in due course is respectfully requested.

The provisional rejection of claims 1-4, 7, 12-13 and 15-16 based on alleged non-statutory obviousness-type double patenting *vis-à-vis* claims 1-6, 11, 12 and 16 of copending, related Serial No. 10/560,617 is respectfully traversed.

The invention presently claimed in the instant application represents an improvement over the earlier invention of inventor Tateson alone as reflected in the earlier filed related application. It will be noted that inventor Tateson is also a co-inventor named in the instant application.

Among possible other distinctions, it will be noted that the claims in the earlier related application require generation of status data which includes the position of the device, as well as a "forwarding direction." As will become clearer from the following

discussion, the claims in the present application (especially as above amended) are believed to be patentably distinct from the claims in the related, earlier filed, copending application.

The rejection of claims 1-3, 12 and 16 under 35 U.S.C. §102 as allegedly anticipated by Billhartz is also respectfully traversed – as is the rejection of claims 4-10, 13-15 and 17-18 under 35 U.S.C. §103 as allegedly being made "obvious" based on Billhartz in view of Krishnamurthy '448 and Stanforth '275, as well as the Ivan publication.

Before discussing the references cited in the present U.S. application in detail, attention is also directed to the attached document related to prosecution of a European counterpart application. There, the Examiner has relied upon WO 2005/006668 (the PCT equivalent of the related, earlier filed, copending application US 2006/0126524) and the paper by Tian He, *et al.* These references are denominated D3 and D4, respectively, in related EPO proceedings. The Examiner will find attached papers from the EPO file including a recently filed response to an office action dated August 18, 2008, discussing reasons for patentable distinctness of the present improvement invention *vis-à-vis* such prior art.

Both of these documents teach use of vector properties (see, for instance, the reference to position awareness in the second reference). The present invention specifically only uses <u>scalar</u> properties, without any need for vector properties such as

position. A copy of a response filed in an EPO counterpart of this application explaining this distinction in more detail is also attached.

It will be noted that the related, copending, earlier filed Serial No. 10/560,617 is being examined by Examiner Ben Liu in Art Unit 2616. Although such application was allowed as of September 26, 2008, the applicant has more recently filed an RCE with a supplemental IDS for further consideration and, of course, a copy of such additional prior art is also attached hereto.

The attached response to the EPO uses a water-flow analogy. Briefly, however convoluted a surface is, a fluid will find its way to the lowest point of that surface. The route may be very indirect – and may even travel away from the final destination in places if necessary to circumvent an elevated region (high status node), but at each step, it will travel from a higher level to a lower level. In the applicants' invention, the data is made to behave in a similar manner – the elevation (status) being determined by the amount of data present. Thus, nodes with a high level of data to transmit will forward it to a nearby lower status node, which will in turn raise its own status level. Indeed, if it were not for the creation of new data and the presence of the data sink to abstract the data from the system, the nodes would eventually all have the same status.

Such "water flow-based" routing does not rely on knowledge of positional information about the mobile nodes. It takes into account relative separation for comparing forwarding candidates, but does not need to know where the devices are, in

space, or how these positions relate to the location of the ultimate destination. Because there is one (or more) network sink(s), following this protocol will necessarily mean that devices in a forwarding path to the sink will have given up their packets, and so be good bets to act as conduits for more packets, whereas those devices that are stranded from a path to the sink will tend to accumulate their own sensor packets, and so will have high potential energy, with packets tending to flow away from themselves.

Getting positional information is expensive, in terms of both power and hardware, so there are applications that will want to rely on a best-effort performance, where forwarding will be opportunistic. In applicants' invention, the **routing** (i.e., logic of finding a path) is embodied implicitly within the process of identifying a relay who has the capability to carry and forward the packets. The cited art assumes that the devices can make a geographic-based decision on routing, but augment that directional knowledge with information about the suitability of devices that fulfill the (Cartesian) direction of forwarding criterion.

The applicants' claimed invention is quite different from the cited art. The prior art is a much more conventional approach with route request packets being broadcast, and this means flooded through the network. This is unscalable and would not converge for a network whose nodes are moving fast relative to the rate of packet communication. Note that for resource-constrained systems (low-power devices), the overhead of network traffic assumed in the prior art would also be unsustainable in terms of

battery power. What the applicants' invention provides is an efficient way for very simple, very low-power, highly mobile devices to transmit data to a network sink, with very little state information being needed, and that only for nearest neighbors. Therefore, the two approaches are not closely comparable because they make very different assumptions about the capabilities of the nodes.

The Examiner's interpretation of "status data" as equating to Billhartz's "traffic information" is erroneous. The Billhartz "traffic information" appears to be simply a measure of the volume of traffic, whereas applicants' status data is defined as also relating to the separation of the device from other devices. Furthermore, the Examiner's interpretation of "separation" is also inconsistent with the clear meaning in applicants' claims. The Examiner appears to equate separation to hop count – the number of intermediate nodes necessary to relay a message between two specified nodes – here the source and destination of the message. As should be apparent from applicants' specification and claims, the "separation" referred to by applicants relates to the distance (however that may be measured) between one node and an adjacent one – i.e., the <u>distance</u> of a <u>single</u> hop.

Billhartz (paragraph [0032]) requires a destination node to be defined and known to all other nodes. The applicants' claims require only the status values of the near neighbors. These status values are explicitly stated to be <u>scalar</u>, and are thus not capable of defining a position in more than one dimension, as Billhartz does. The status

value of each device is determined in part by the status values of their neighbors (such that those with more data buffered have higher values than neighbors with less data).

Any practical system will have one or more source nodes at which data is generated (whose status will increase as data accumulates) and one or more destination nodes at which the data is collected (whose status is held at zero). Provided that this is the case, the system will organize itself such that data flows from the high status nodes towards the lower status nodes and ultimately to the sink. However, it is not necessary for the position (or indeed any other property) of any node – including the sink – to be known by any other node. Even the immediate neighbors only need to know the status value, and the distance to the node.

The Examiner also asserts that the Billhartz transmission of a quality of service request RREQQ from the source node equates to applicants' requirement for transmitting the status value to other devices. However, the RREQQ does not meet applicants' definition of status value (it is not related to the status values of devices other than the source node). Billhartz disseminates the RREQQ throughout the system to identify a complete route (again paragraph [0032]). Applicants' system only compares status values between next neighbors.

By only arranging routing from one node to the next, rather than setting out a complete route from the source to the destination, the signalling overhead can be greatly reduced. This, and the consequent saving in battery power, is an important

consideration in the sort of applications envisaged for these devices, where the priority is to collect as much data as possible using the available battery life, rather than delivering each item of data by the fastest available route. The use of remaining battery life as an indicator of status (raising the status of those with least life remaining, to minimize the data they are required to forward) is one additional feature to improve this utilization, but the basic principle is more general than this – it is having the nodes determine in which direction data should flow between them and their neighbors, on the basis of information exchanged only with their closest neighbors such that they can identify the next hop (and only the next hop) to the destination.

This has been clarified by the above amendments by specifying that the relay device receives status data from similar devices "in direct communication with the data relay device" and making it clear that the claimed separation is an actual distance taken by the <u>single</u> hop to that device, not a number of hops. Support for this is found in the specification, e.g., "identifying a transmission hop in the right direction" (page 5, line 29), and the discussion of separation at page 7, lines 18-22.

In view of such fundamental deficiencies of the primary Billhartz reference as already discussed above with respect to independent claims, which deficiencies are not supplied by the cited additional references, it is not necessary at this time to present further detailed discussion with respect to additional deficiencies of Billhartz and/or Billhartz in combination with other prior art with respect to other aspects of the rejected

claims. Suffice it to note that, as a matter of law, it is impossible to support a *prima facie* case of anticipation or obviousness unless the cited art teaches or suggests each feature of every rejected claim.

As will be noted, the claims have been amended above so as to clarify and/or more particularly point out various novel features as discussed above. In addition, attention is drawn to new method claims 20-21 directed to a method of collecting data from distributed mobile data sensors respectively associated with mobile data relay devices communicating with each other and an ad hoc mobile network when they happen to be within communication range of each other. It will be seen that new independent claim 20 not only requires collecting sensor data in buffer stores of each of the mobile data relay devices, but also requires generating a scalar status value in each of the devices based on current local status parameters including at least the amount of collected sensor data currently accumulated in its buffer store and its separation distance from other of said mobile data relay devices. Claim 20 also requires communicating respective said scalar status values between the mobile data relay devices that happen to be within communication range of each other and, at each mobile device, evaluating received scalar status values form other devices with respect to its own scalar status value. Finally, claim 20 requires, if the evaluation satisfies a predetermined condition for an identified one of the other devices, then transmitting at least part of its accumulated sensor data from its buffer store to the identified other device where

the received sensor data is stored in its buffer store for later similar transfer to yet another device.

Dependent claim 21 adds yet further detail where at least one higher powered data sink station also communicates with the mobile devices if they happen to be within communication range and, when it does so, communicates a scalar status value which, when received by a data relay device, will be evaluated so as to cause the data sink station to be identified as the recipient of accumulated sensor data from the buffer store of that data relay device.

Accordingly, this application is now believed to be in condition for allowance, and a formal notice to that effect is earnestly solicited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: J H Nelson 30481
For Larry S. Nixon
Reg. No. 25,640

LSN:lef

901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100

ANNOTATED MARKED UP DRAWINGS
FOR SN 10/568,496

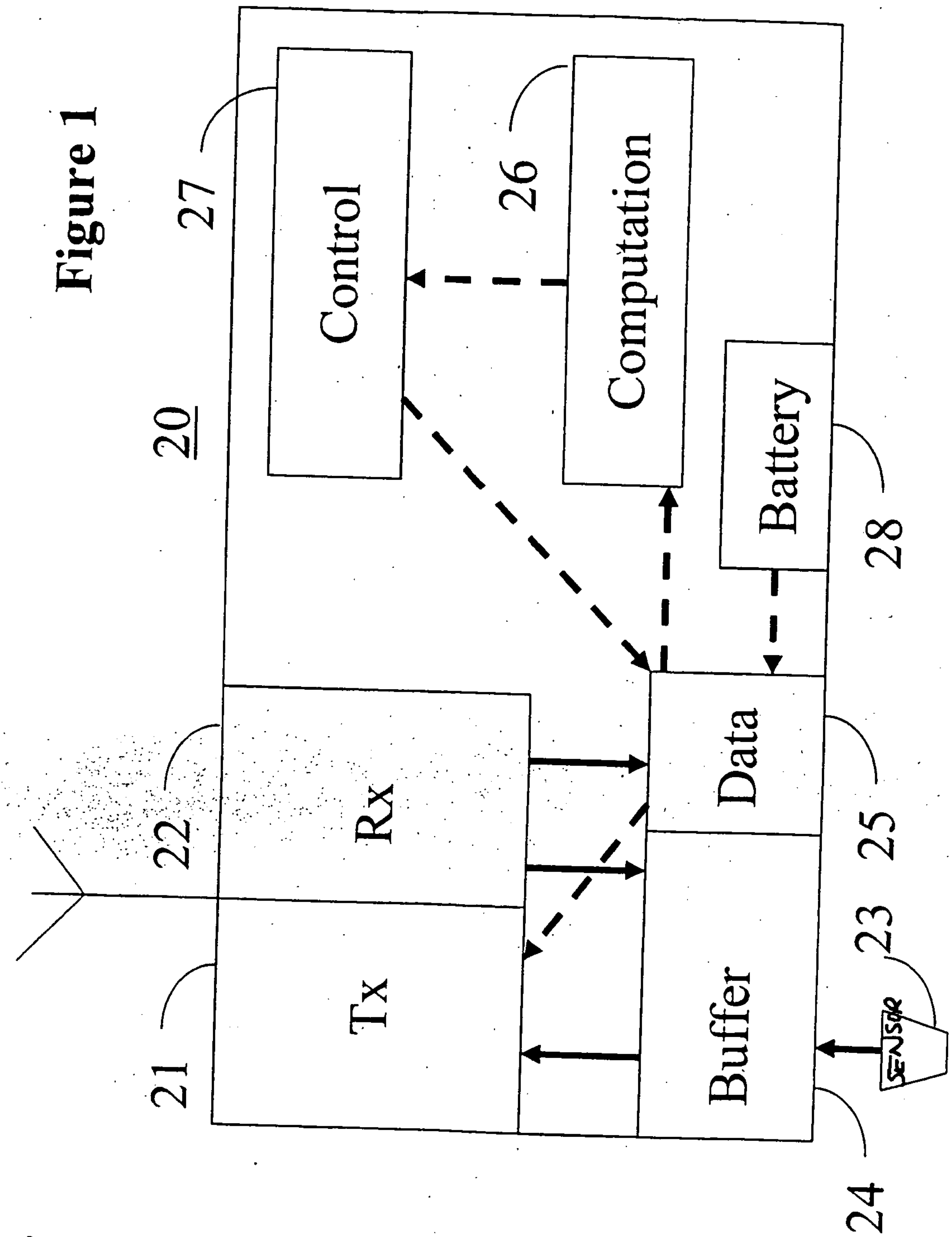
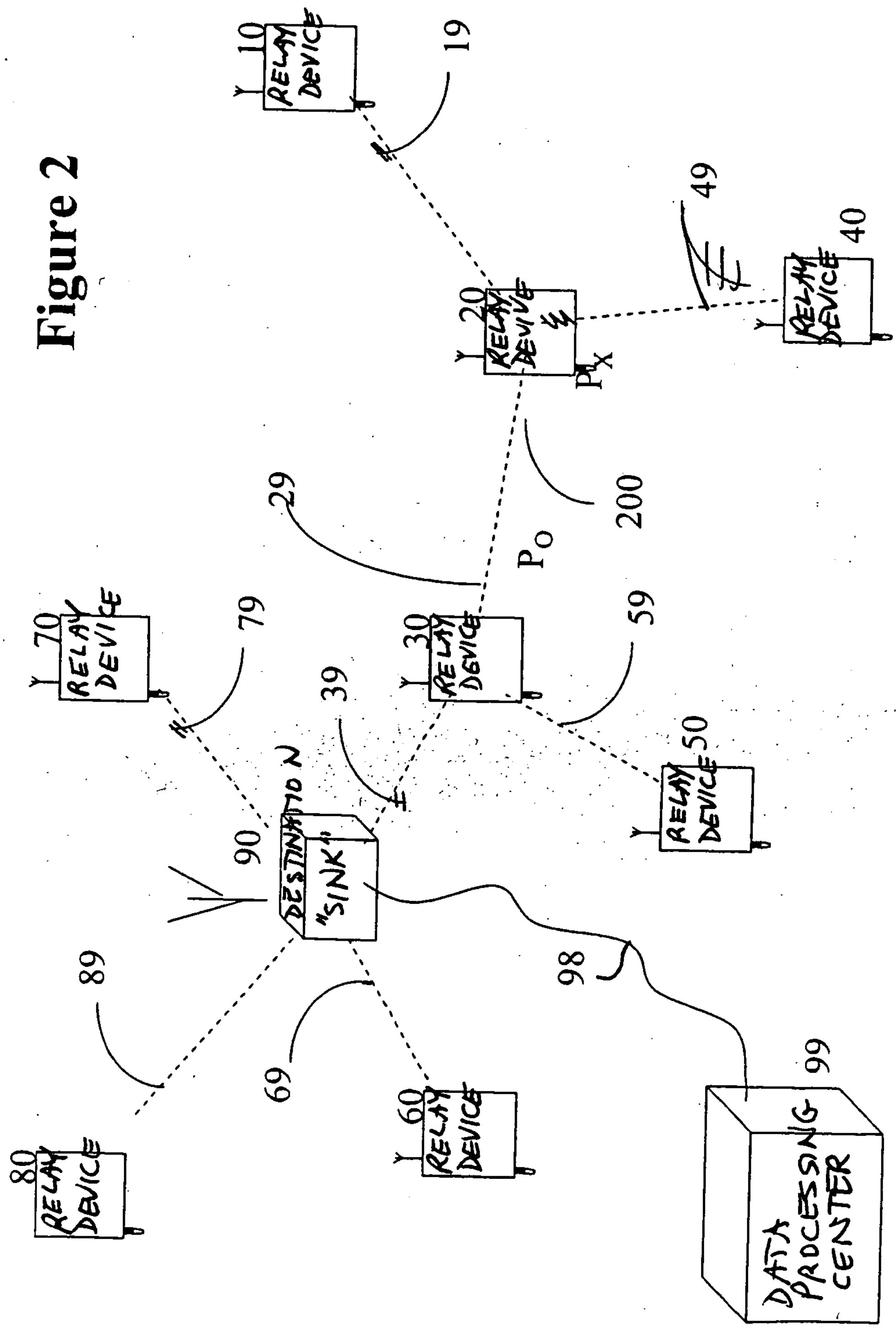


Figure 1

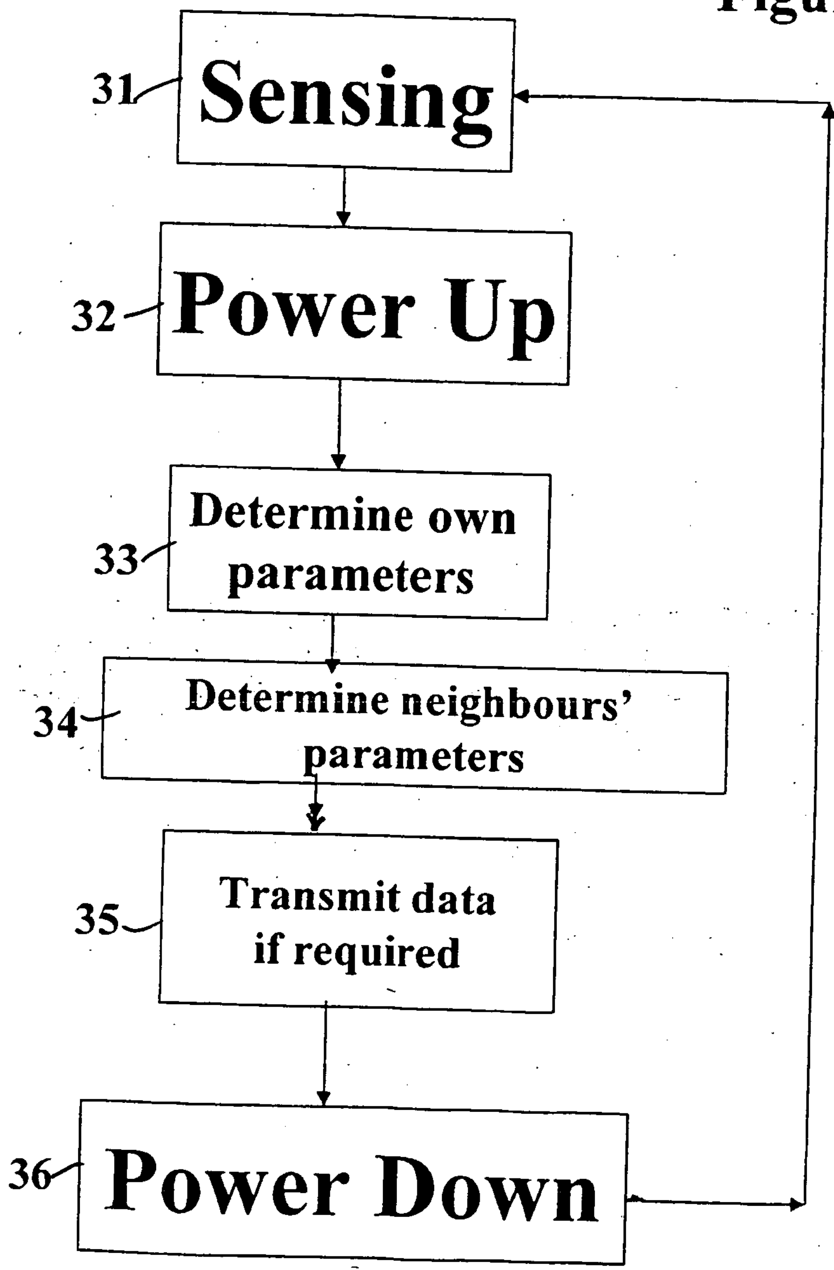
ANNOTATED MARKED UP DRAWINGS
FOR SN 10/568,496

Figure 2



ANNOTATED MARKED UP DRAWINGS
FOR SN 10/568,496

Figure 3



ANNOTATED MARKED UP DRAWINGS
FOR SN 10/568,496

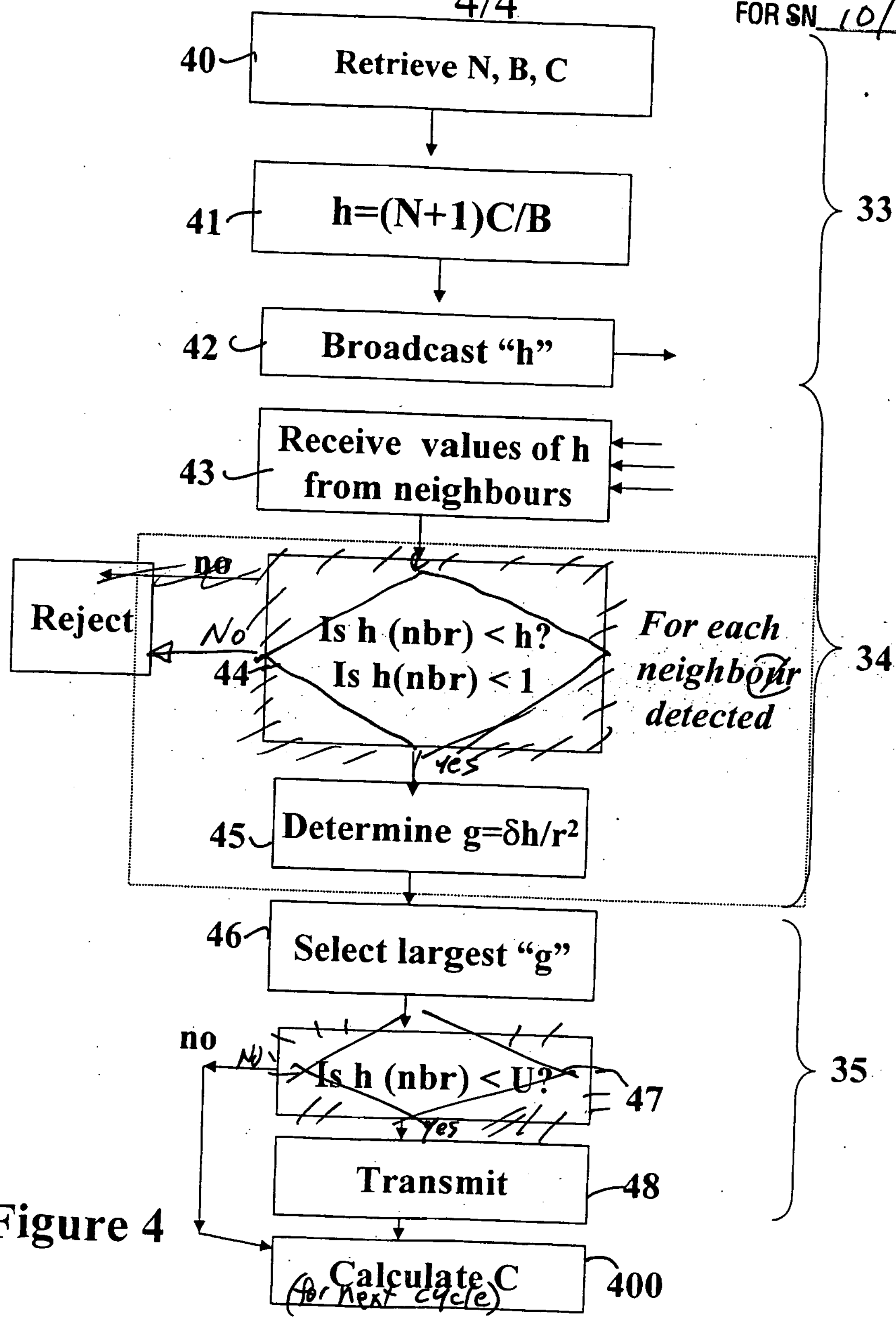


Figure 4